REMARKS

Claims 1-33 are pending in the application. Claims 1, 4, 9, 14, 17, 22, 29, 30, and 31 have been amended herein. No new matter is added by the amendments.

Rejections under 35 U.S.C. § 103

I. Claims 1-5, 10, 14-18, 22-23, and 27-30 were rejected under 35 U.S.C. § 103(a) as being unpatentable over Krause et al. (U.S. Patent No. 6,701,174, hereinafter "Krause") in view of Clough (U.S. Patent No. 5,977,979). Applicants respectfully submit that claims 1-5, 10, 14-18, 22-23, and 27-30 as amended would not have been obvious in view of the cited references.

Krause describes a computer-implemented method of planning bone distraction. Krause is not concerned with prostheses and prosthetic implants such as artificial hips and knees. Instead, it is concerned with reconstructive bone surgery that involves cutting through a bone, attaching an external adjustable frame to the bone by wires passing through the flesh, and adjusting the frame to pull the parts of the bone apart slowly to encourage bone growth across the gap so as to extend and/or reshape the bone. The success of such a procedure depends on how the frame is fitted and subsequently adjusted. Thus, Krause relates to an entirely different problem than the present invention.

The method of Krause involves providing two orthogonal X-ray images of a bone to a computer with a view to generating a three-dimensional model of the imaged bone. This is done by extracting the contours or boundaries of the bone from the two images. (either automatically or indicated by a user viewing the images). The contours are projected out from the orthogonal images so that they intersect and define a closed volume that closely matches the actual volume of the bone. This volume information is used to select a template from a database of 3D template bone models. The template bone model is then scaled and positioned until its contour or boundary is considered to be optimum with respect to the real bone boundaries from the X-ray images. Then the scaled, updated template bone model is subjected to a computerized deformation process to deform it until it matches the actual patient's bone. This, a 3D model of the patient's bone is obtained. This model is then used to perform computer simulation and planning of the bone

distraction procedure, so that the surgeon can determine how to position and adjust the external frame to achieve the desired bone reconstruction.

The Examiner refers to column 21, line 17 of Krause as justification that Krause discloses operations involving orthopaedic prostheses. However, in actual fact the template database 52 in Krause contains templates which are 3D models of bones, not templates representing prostheses. The only reference in Krause to prostheses is the isolated remark at column 21, line 17, stating that a possible application for the described software is an "aide in the design of custom prosthetic implants". It is not at all clear from this statement how the described software could be modified for such an application, and in particular, there is nothing to suggest that the database of 3D bone models should be changed into a library of templates of orthopaedic prostheses, as in the present invention.

Claim 1 as amended states:

> A computer-implemented method of planning orthopaedic surgery, comprising:
>
> providing a library of templates representing orthopaedic prostheses;
>
> displaying a patient image showing anatomical features that are relevant for the orthopaedic surgery being planned;
>
> scaling the patient image according to user input;
>
> displaying over the patient image a geometrical construct comprising a plurality of interrelated shapes and lines defined by a plurality of interrelated geometric parameters <u>corresponding to parameters describing the orthopaedic prostheses represented by the templates in the library</u>;
>
> allowing a user to reconfigure the geometrical construct by adjusting the geometric parameters according to the anatomical features of the underlying patient image <u>so as to specify a mapping of bone structure shown in the patient image</u>; and
>
> automatically selecting at least one template from the library in accordance with the geometric parameters adjusted by the user.

In the absence of a library as claimed, Krause clearly cannot teach or suggest the feature of the amended claims of "a geometrical construct comprising a plurality of shapes and lines defined by a plurality of interrelated geometric parameters corresponding to parameters describing the orthopaedic prostheses represented by the templates in the library", the geometrical construct being displayed over the patient image. Krause has no

library of templates of prostheses, so there can be no parameters describing the prostheses which could be reflected in the geometric parameters of a geometrical construct, and hence no possibility of any such geometrical construct being displayed over a patient image.

Furthermore, in the absence of a geometrical construct as claimed, it is not possible that Krause teaches user reconfiguration of the geometrical construct by adjusting the geometric parameters "so as to specify a mapping of the bone structure shown in the patient image".

These two amendments highlight a particular object of the present invention. Providing a reconfigurable geometrical construct defined by a plurality of interrelated geometric parameters corresponding to the parameters of the prostheses represented by the templates allows a user to reconfigure the geometrical construct so as to specify a mapping of the patient's bone structure shown in the image which is directly related to the parameters of the prostheses in the library (owing to the relationship between the parameters of the prostheses and the parameters of the geometrical construct). Thus, the geometric parameters of the geometrical construct can be directly used to automatically select a suitable template from the library (as in the final feature of claim 1), because the geometric parameters, after reconfiguration of the construct, are related to the patient's anatomy owing to the mapping specified during the reconfiguration. This allows selection of a prosthesis template to be automated and made more accurate, while still allowing user input where it is most valuable, in the interpretation of patient images (required for the reconfiguration of the geometrical construct).

These features are not taught in Krause, which instead describes providing images of a patient's bone, using outlines of the bone from the images to select a template 3D bone model from a database of models, and deforming the template 3D bone model to match the patient images so that a 3D model of the patient's bone is produced from the template model. This is clearly different from the present invention. In particular, in the final office action, the Examiner equates Krause's template 3D bone models with both the templates in the library of claim 1, and also with the geometrical construct of claim 1 (see page 5, line 1 and lines 6-7 of the office action). According to the present invention as claimed, the templates and the geometrical constructs are distinct and separate features with a specified

relationship. Hence, the template 3D bone model of Krause cannot correspond to both of these features, and Krause therefore does not teach either feature.

Clough is cited as teaching scaling of the patient image according to the independent claims. Applicants respectfully submit that Clough does not supply the deficiencies detailed above with reference to Krause and further does not teach or suggest scaling as claimed. While Clough is related to scaling and images, it is concerned with two-dimensional simulation of three-dimensional scenes for display to a user, and relates to image processing and display, and not to computer-implemented planning of orthopaedic surgery (neither the bone distraction of Krause, nor the prostheses implantation of the present invention). The scaling described in Clough is the scaling of objects moving within the displayed scene so as to produce the correct size of the object with respect to its apparent distance from the viewer, and not scaling of patient images to correct for X-ray magnification. Clough is in an entirely different technical field from Krause, and the skilled person would not look to Clough to learn how to scale patient images, and moreover, would not be taught how to do so if he did. Therefore, one of ordinary skill would find not motivation to combine the references to achieve the claimed invention.

Moreover, as stated above, the proposed combination would not result in the claimed invention, at least because Krause fails to teach a computer-implemented method of planning orthopaedic surgery as in claim 1, and Clough fails to teach how to scale a patient image.

For all of these reasons, Applicants respectfully submit that claim 1 would not have been obvious to one of ordinary skill in the art at the time they were made. Claims 2-5 depend from claim 1 and include further limitations thereon. Therefore, claims 2-5 are allowable for the same reasons given with reference to claim 1.

Claim 10 depends from independent claim 9, which includes elements corresponding to each of the elements discussed with reference to claim 1. Therefore, Applicants respectfully submit that claim 10 (which include limitations in addition to those of claim 10) is allowable over Krause and Clough.

Independent claim 14 includes similar limitations to those discussed with reference

to claim 1. Therefore, Applicants respectfully submit that claim 14 and its dependent claims 15-18 are allowable over Krause and Clough.

Independent claim 22 includes similar limitations to those discussed with reference to claim 1. Therefore, Applicants respectfully submit that claim 22 and its dependent claims 23, 27 and 28 are allowable over Krause and Clough.

Independent claim 29 includes similar limitations to those discussed with reference to claim 1. Therefore, Applicants respectfully submit that claim 29 and its dependent claim 30 are allowable over Krause and Clough.

II. Dependent claims 6-8, 11-13, 19-21, and 24-26 were rejected under 35 U.S.C. § 103(a) as being unpatentable over Krause in view of Clough, and further in view of Tanaka (U.S. Patent No. 6,692,448). Tanaka is cited as teaching an artificial bone template selection method that includes geometric parameters that are adjusted according to anatomical features of a femur so as to allow selection of a template representing a femoral component of a hip prosthesis.

However, Applicants respectfully submit that Tanaka does not disclose selection in accordance with geometric parameters of a geometrical construct displayed over a patient image and reconfigured by a user according to the anatomical featured shown in the image. In addition, as discussed above, the invention of the independent claims would not have been obvious in view of the combination of Krause and Clough. Further, the combination of Krause and Clough does not result in the claimed invention. As Tanaka does not supply the stated deficiencies of either Krause or Clough, the combination of the three references does not result in the invention of claims 6-8, 11-13, 19-21, or 24-26. For all of these reasons, Applicants respectfully submit that claims 6-8, 11-13, 19-21, and 24-26 would not have been obvious in view of the cited references.

CONCLUSION

In view of the foregoing amendments and remarks, Applicants respectfully submit that the claims as amended are allowable over the prior art. Applicants respectfully request allowance of all of the pending claims and respectfully request the Examiner to phone the undersigned if it would facilitate such allowance.

AUTHORIZATION TO CHARGE DEPOSIT ACCOUNT

Please charge deposit account 503616 for any fees due, and not paid herewith, in connection with this Office action response.

Respectfully submitted,
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